

REMARKS

Upon entry of this amendment, claims 1-12 are all the claims pending in the application. Claims 11 and 12 have been added by this amendment. No new matter has been added.

I. Objection to the Drawings

The Examiner has objected to the drawings for the reasons set forth on page 2 of the Office Action. In particular, the Examiner asserts that Figs. 21 and 22 should be designated by a legend such as --Prior Art--. Applicants are submitting herewith replacement sheets for Figs. 21 and 22 wherein the Figures have been labeled as --Prior Art--. Accordingly, Applicants kindly request that the objection be reconsidered and withdrawn.

II. Objections to the Specification

The Examiner has objected to the specification and abstract for the reasons set forth on pages 2-3 of the Office Action. Applicants submit herewith a substitute specification and abstract which address the Examiner's objections and include various editorial amendments that have been made for grammatical and general readability purposes. No new matter has been added. Also enclosed is marked-up copy of the original specification and abstract showing the changes incorporated into the substitute specification and abstract.

Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw the objections to the specification.

III. Claim Rejections under 35 U.S.C. § 112, second paragraph

The Examiner has rejected claims 1-10 under 35 U.S.C. § 112, second paragraph as being indefinite. Applicants note that the claims have been amended in accordance with the Examiner's suggestions so as to overcome this rejection. Accordingly, Applicants respectfully request that the rejection be reconsidered and withdrawn.

IV. Claim Rejections under 35 U.S.C. § 102

The Examiner has rejected claims 1, 2, 4 and 5 under 35 U.S.C. § 102(b) as being anticipated by Kitamine et al. (U.S. 6,034,494).

Claim 1, as amended, recites that a driver operates such that an ac current having a sine-waveform is output to a dc brush-less motor. Applicants respectfully submit that Kitamine does not disclose or suggest at least this feature of claim 1.

Kitamine discloses a control device for a brushless DC motor 1 in which electric power is supplied to the motor 1 from a DC power source 9 through an inverter 2 (see col. 3, lines 36-38). In Kitamine, to drive the motor 1 during a start-up-drive mode, 3-phase upper and lower signals 8u-8z are generated based on a synchronous signal (see col. 4, lines 55-58; and Figs. 3 and 5).

During the start-up-drive mode of Kitamine, the speed of the motor is increased until it reaches a speed "A" (see Fig. 4 and col. 4, lines 58-61). When the speed of the motor reaches speed "A", acceleration of the motor is terminated, and the frequency of signals 8u-8z becomes constant (see col. 4, line 66 - col. 5, line 1).

As noted above, claim 1 has been amended to recite that the driver operates such that an ac current having a sine-waveform is output to the dc brush-less motor. As shown in Fig. 5 of Kitamine, however, the output of the inverter 2 is a square wave, and thus, the current flowing in the motor 1 does not have a sine-waveform.

In the present invention, by supplying a sine-waveform to the dc brush-less motor, it is possible to provide more accurate position detection of the motor as opposed to the configuration disclosed in Kitamine.

In view of the foregoing, Applicants respectfully submit that Kitamine fails to disclose, suggest or otherwise render obvious the feature of a driver which operates such that an ac current having a sine-waveform is output to a dc brush-less motor, as recited in amended claim 1.

Accordingly, Applicants submit that claim 1 is patentable over the cited prior art, an indication of which is kindly requested.

In addition, Applicants note that claim 1 recites that the driver controls the dc brush-less motor such that a current-phase of winding of the dc brush-less motor is advanced with respect to an induction voltage-phase generated in the winding at a start of driving the compressor, and then the advancement of the current-phase is reduced. Applicants respectfully submit that Kitamine also fails to disclose or suggest this feature of claim 1.

As noted above, Kitamine discloses a start-up-drive mode in which the speed of the motor is increased until it reaches a speed "A" (see Fig. 4 and col. 4, lines 58-61). After reaching the speed "A", the motor enters a transient period for switching from the start-up-drive to a self-controlled-drive (see col. 5, lines 46-49).

In the transient period, a microcomputer 8 calculates a phase difference between a phase (real phase) of the rotor position signals and a driving voltage phase of the 3-phase upper and lower signals 8u-8z, whereby the switch of the motor to the self-controlled-drive is carried out only when the phase difference is sufficiently small to avoid a motor stall or an excessive shock (see Abstract and col. 5, lines 23-29 and 34-37).

Thus, in Kitamine, in a start-up mode of driving a compressor, the speed of the motor increases until it reaches the speed "A", and after reaching this speed, the motor enters a transient period in which the phase difference is determined

Accordingly, while Kitamine discloses that the start of driving a compressor involves increasing the speed of until it reaches the speed "A", Applicants respectfully submit that there is no disclosure in Kitamine regarding controlling the motor at the start of driving such that the current-phase of the motor is advanced.

In other words, in Kitamine, while the speed increases during a start-up-drive mode, there is absolutely no disclosure regarding an advance of the phase-current during the start-up-drive mode. Instead, in Kitamine, a phase difference is detected only during the transient period such that it can be determined when it is safe to switch from the start-up-drive mode to the self-controlled-drive mode.

In view of the foregoing, Applicants respectfully submit that Kitamine fails to disclose, suggest or otherwise render obvious the feature of a driver which controls the dc brush-less motor such that a current-phase of winding of the dc brush-less motor is advanced with respect to

an induction voltage-phase generated in the winding at a start of driving the compressor, and then the advancement of the current-phase is reduced, as recited in claim 1.

Accordingly, Applicants submit that claim 1 is patentable over Kitamine, an indication of which is kindly requested. Claims 2, 4 and 5 depend from claim 1 and are therefore considered patentable at least by virtue of their dependency.

V. Claim Rejections under 35 U.S.C. § 103(a)

A. The Examiner has rejected claims 6, 7, 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over Kitamine et al.

Claims 6, 7, 9 and 10 depend from claim 1. As noted above, Applicants submit that Kitamine fails to disclose, suggest or otherwise render obvious all of the features recited in claim 1. Accordingly, Applicants submit that claims 6, 7, 9 and 10 are patentable at least by virtue of their dependency.

B. The Examiner has rejected claims 3 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Kitamine et al. in view of Heeren et al. (U.S. 6,078,158).

Claims 3 and 8 depend from claim 1. Applicants respectfully submit that Heeren fails to cure the deficiencies of Kitamine, as discussed above, with respect to claim 1. Accordingly, Applicants submit that claims 3 and 8 are patentable at least by virtue of their dependency.

VI. New Claims

Claims 11 and 12 have been added as new claims. Claims 11 and 12 depend from claim 1 and are therefore considered patentable at least by virtue of their dependency for the reasons discussed above.

VII. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may best be resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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